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APPLIED PHYSIOLOGY OF THE CIRCULATION.

Therapeutics of the Circulation: Eight Lectures delivered in the Spring of 1905 in the Physiological Laboratory of the University of London. By Sir Lauder Brunton, Bart., F.R.S. Pp. xii+272. (London: John Murray, 1908.) Price 7s. 6d. net.

PERHAPS there is no department of the healing art in which the vivifying and reconstructing influence of physiology and of laboratory methods is more apparent than in that devoted to the study of disorders and diseases of the circulation. Of this position the recently published volume of lectures by Sir Lauder Brunton affords an excellent illustration, for all through its pages we see how physiology aids the physician, not only in clarifying his conceptions of clinical facts, but in applying and inspiring his treatment of circulatory ailments.

For the execution of the work the author possesses the happy combination of advantages derived from his early laboratory training under the celebrated Ludwig, from his life-long love of physiology, and from his extended experience as a clinical worker and teacher. It has been said that the physician is—or should be—a physiologist and something more; and that “something more” is the practical quality of applying, not only his pathological, but also his physiological data to the work of the hour. The dominance of that quality in the author's handling of the material of his lectures is a prominent feature of the volume.

In the earlier lectures we have an exposition of the physiology of the circulation. The clear and comprehensive description of the forces at work will be appreciated, not only by professional readers—whether physiologists or clinicians—but by those members of the community who take an interest in the study of physiological subjects. Moreover, even the medical reader fairly conversant with clinical work on the circulation may, by the perusal of these lectures, gain something in the clearness of his conception of the fundamentals presented by an author who has the gift of exposition and happy illustration.

In the first lecture we have a description of the parts played by the heart, the arteries, capillaries and veins, the vaso-motor system of nerves, and the accessory aids to the circulation furnished by the fasciæ and muscles; these and cognate topics are discussed under such headings as sleep of the heart, motor and peristaltic action of arteries, accessory muscles of the circulation, arterial tension or blood-pressure and its regulation, the influence of the muscular and splanchnic areas, depressor nerves, independent pulsation of veins, &c.

But the physiologist and pathologist will be more particularly attracted to that portion of the lecture which is devoted to the study of the point of origin and the conductivity of the impulse which culminates in the contraction of the ventricle, a subject which has, especially of late years, fascinated the pathologist as well as the physiologist—for it affords the key to

the irregularity of the heart's action, and to the dissociation of the auricular and ventricular contraction. It is now some twenty-five years since Gaskell demonstrated the continuous track of the impulse from the venous sinus, in which it originates, to the auricle, and from the auricle to the ventricle; and the soundness of this physiological conclusion has since been confirmed by the work of Stanley Kent, W. His, jun., and more recent workers (such as Tawara and Keith), who have established the existence of a specialised muscular tissue possessing neuro-muscular properties, which forms the anatomical basis of the track followed by the impulse from the sinus to the ventricle. In introducing this subject the author cites the work of Romanes on the medusa, a polyp which is circumscribed by a bell-shaped piece of contractile protoplasm margined by a nervous gangliated chain and a fringe of mobile tentacles. This work, though executed some few years before that of Gaskell, forms a happy illustration of the broad results of the inquiry into the conductivity in the heart muscle, and will well repay perusal.

Some recent workers hold that it is an inherent property of the heart muscle to originate and conduct the stimulus which causes the heart to beat, they regarding this function as independent of the nervous ganglia and the nerve fibres in the heart. The author is not one of these. He says, referring to his work with Cash:—

“These experiments, which were not only very numerous but very varied, seemed to us to show that, just as in a medusa, there are in the heart two distinct channels, the nervous as well as the muscular, by which stimuli are conducted from one part of the heart to another, and that the nervous conduction may interfere with the muscular conduction” (pp. 32-4).

Furthermore, he points out that “the importance of the cardiac ganglia in originating the beats of the heart has been prominently brought forward since these lectures were given, by Dogiel and Archangelsky, *Pflüger's Archiv*, July, 1906” (p. 30); that “Kronecker and Imchanitzky have shown that the bundle of Stanley Kent and His (connecting the auricles and ventricles) can be ligatured without disturbing the coordination between the auricles and ventricles” (p. 225); and that Paukul has found nervous plexuses in that bundle, “injury of which disturbs coordination, while ligature of the muscular part of the bundle does not impair coordination” (p. 225).

In connection with this subject, the reader will also find further interesting matter in the appendices A and D. In appendix A the author treats on the conduction of stimuli and the contractility of organic tissues allied to that of the fibres of His and Purkinji in the heart—such as contractile vegetable protoplasm (producing the movements of plants), contractile animal protoplasm (amoeba, leucocytes), neuro-muscular cells (fresh-water hydra). Appendix D is an epitome of an interesting contribution by the author's old friend and fellow-worker of nearly forty years ago in Ludwig's laboratory, Prof. Kronecker, of Berne, who has done so much to advance our knowledge

of the physiology of the heart. From it we gather, among other things, that it was Kronecker who discovered "that the heart is not irritable during systole"—denominated by Marey the refractory period; that Kronecker and his pupils found that the heart "ceases to beat if its contents are deprived of all stimulating properties"—from which fact we may infer "that there is no true automatism in the ventricle, but only intermittent action to a constant stimulus"; that "no other material enables the heart to beat except serum albumin, and to a very slight degree, serum globulin"; that Bowditch's law (minimal stimuli causing maximum pulsations, or in a word "all or nothing") holds good *without any exception*; that the rhythmicity of the flow through the arteries causes much more fluid to pass through them than when the flow is continuous; and that self-massage of the heart and vessels is an important factor in maintaining the efficiency of the circulatory mechanism. The last-named topic (self-massage of the heart, arteries, lymphatics, and veins) is also fully discussed by the author, who points out its important bearing on the nutritive integrity of the heart and the arterial wall. The author suspects that some may consider he has devoted too much space to the consideration of self-massage of the heart and vessels, and the conduction of stimuli in the heart. There is no doubt, however, that he is justified by the scant reference to these subjects in the text-books and by their practical importance.

In lectures ii. and iii., and in the appendix B, we have a very full and well-illustrated description of most of the instruments which have been devised for the measurement of blood-pressure in man for clinical purposes. The variety in construction shows us what a large amount of thought and ingenuity have been expended in devising them, so as to satisfy as much as possible clinical needs and accuracy. The introduction of such devices into clinical work has always been regarded with suspicion by physicians, who ever since the days of Herophylus have trusted with implicit faith to the infallibility of the *tactus eruditus*. In view of this natural distrust it is therefore of some importance, when discussing the claims of these innovations, to attach due weight to the objections which may be advanced to their adoption. The author does not, however, touch on this aspect of the clinical employment of blood-pressure apparatus. Probably this omission has arisen from want of space or the unsuitability of the subject for treatment in these lectures. We are therefore left to infer that he highly appreciates the advantages derived from the adoption of the methods now in use for the clinical measurement of blood-pressure, and that the practical value of these methods is amply justified by observation and experience; and there is no doubt that that is the verdict of the majority of those who have so far adopted these methods. The test of their usefulness is measured by the help and satisfaction they afford in the daily routine of practice rather than in the discovery of minor defects, which actually do not count for anything in disturbing the conclusions of the physician in clinical work. The author has, therefore, wisely devoted a

large portion of his lecture to this important subject, which more than any other has made it possible to apply our knowledge of the physiology of the circulation to the service of man.

To comment on the remaining lectures in which the author discusses in an instructive manner various diseases of the heart and their treatment would unduly extend this review, and introduce topics somewhat extraneous to the scope of *NATURE*.

But these remarks should not be closed without a reference to the profusion of excellent illustrations, which add greatly to the clear conception of the text, and the admirable indices, which facilitate easy and accurate reference.

JUSTUS VON LIEBIG.

Justus von Liebig. By Jacob Volhard. Band I., pp. xii+456. Band II., pp. viii+437. (Leipzig: J. A. Barth, 1909.) Price 24 marks.

THIRTY-FIVE years have passed since Liebig died, and we are at length presented with a biography worthy of the man and his work. At the time of his death innumerable articles on his life and achievements appeared in the newspapers and periodical press of practically every country in the world, and almost every known scientific society having relations with chemistry made reference to his splendid services, and to the irreparable loss which humanity had suffered by his decease.

Some of these, such as the memorable lecture of Hofmann, are among the classics of chemical biography. But a generation has had to come and go before the appearance of a work which would serve to fix for all time without question Liebig's true place in the history of the science he did so much to illumine and develop. The delay has not been without its compensations. Time is required to estimate the real value of such services as Liebig was able to render. The outcome of his work was not wholly apparent during his lifetime, or even in the years immediately following his death. Germany was barely a united nation in 1873. Although the seed of her supremacy in chemistry, and in many branches of the chemical arts, had been sown in the early Giessen days, and although he lived to see the signs of its abundance, Liebig died before the harvest was garnered. It is hardly garnered yet. The impetus which he gave to the study of chemistry still makes itself felt, not only in his native country, but throughout the world. To him, more than to any other man, is due the inception of the movement resulting in that development and extension of the industries dependent upon organic chemistry which is one of the most remarkable features of our times.

Liebig, a man of good fortune in his life, as the Romans say, is fortunate also in his biographer. With the possible exception of Hofmann, no more fitting choice could have been made than Prof. Volhard. The author and his subject were on terms of strong personal friendship, dating, indeed, from Dr. Volhard's early youth. He was, in fact, like a son of the house in Liebig's family. For some years Dr. Volhard